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DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

045636-5042

U.S. Application No.

09/806821

Unassigned

Priority Date Claimed

International Application No. | International Filing Date

PCT/FR98/02120

October 5, 1998

Title: Invention

~~ACIDITY FERMENTED DAIRY PRODUCTS FLAVOURED WITH WARM FLAVOURS~~

Applicants For DO/EO/US

Denis PAQUET, Jean-Pierre CARON, Jacques DE VILLEROCHE, David LAM, Paul SKROCHOWSKI, Stephane DUBAT, Nathalie TRIAL, Blas TARODO DE LA FUENTE and Jean-Louis CUQ

Applicants herewith submit to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.
3. [ ] This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. [X] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. [ ] is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. [X] has been transmitted by the International Bureau.
  - c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [X] A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. [X] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
  - a. [ ] are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. [X] have been transmitted by the International Bureau.
  - c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
  - d. [ ] have not been made and will not be made.
8. [ ] A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. [ ] An oath or declaration of the inventors (35 U.S.C. 371(c)(4)).
10. [ ] A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

**Items 11. to 14. below concern other document(s) or information included:**

11. [X] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [X] A FIRST preliminary amendment.
13. [ ] A SECOND or SUBSEQUENT preliminary amendment.
14. [X] Other items or information:
  - a. WIPO Publication WO 00/19831
  - b. PCT/IB/308
  - c. PCT/IPEA/409
  - d. PCT/ISA/210

U.S. APPLICATION NO.

INTERNATIONAL APPLICATION NO.

ATTORNEY DOCKET NUMBER

Unassigned 09/806821 PCT/FR98/02120

045636-5042

15.  The following fees are submitted:

**Basic National Fee (37 CFR 1.492(a)(1)-(5)):**

Search Report has been prepared by the EPO or JPO.....\$860.00  
 International preliminary examination fee paid to  
     USPTO (37 CFR 1.482).....\$690.00  
 No international preliminary examination fee paid to  
     USPTO (37 CFR 1.482) but international search fee  
     paid to USPTO (37 CFR 1.445(a)(2)).....\$710.00  
 Neither international preliminary examination fee  
     (37 CFR 1.482) nor international search fee  
     (37 CFR 1.445(a)(2)) paid to USPTO.....\$1000.00  
 International preliminary examination fee paid to USPTO  
     (37 CFR 1.482) and all claims satisfied provisions  
     of PCT Article 33(2)-(4).....\$100.00

**ENTER APPROPRIATE BASIC FEE AMOUNT = \$ 860.00**

Surcharge of \$130.00 for furnishing the oath or declaration later than

[ ] 20 [ ] 30 months from the earliest claimed priority date

(37 CFR 1.492(e)).

Claims	Number Filed	Number Extra	Rate	\$
Total Claims	16 - 20 =	0	X \$18.00	\$
Independent Claim	1 - 3 =	0	X \$80.00	\$
Multiple dependent claim(s) (if applicable)			+\$270.00	\$

**TOTAL OF ABOVE CALCULATIONS = \$**

Reduction by ½ for filing by small entity, if applicable. Verified

Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28)

**SUBTOTAL = \$ 860.00**

Processing fee of \$130.00 for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date  
 (37 CFR 1.492(f)).

**TOTAL NATIONAL FEE = \$ 860.00**

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet

(37 CFR 3.28, 3.31). \$40.00 per property

**TOTAL FEES ENCLOSED = \$860.00**

Amount to be refunded	\$
charged	\$

- a.  A check in the amount of **\$860.00** to cover the above fees is enclosed.
- b.  Please charge my Deposit Account No. 50-0310 in the amount of **\$0-**  
     to cover the remainder above fees. A duplicate copy of this sheet is enclosed.
- c.  Except for issue fees payable under 37 C.F.R. §1.18, the Commissioner is hereby authorized by this paper to  
     charge any additional fees during the entire pendency of this application including fees due under 37 CFR §1.16  
     and §1.17 which may be required, or credit any overpayment to Deposit Account No. 50-0310.

Customer No. 009629

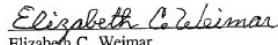
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PATENT

Attorney Docket 045636-5042

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: **Paquet et al.**)  
National Stage of )  
International Application: **PCT/FR98/02120**)  
International Filing Date: **October 5, 1998**)  
Application No. **Not Assigned**) Group Art Unit: **Not Assigned**  
Date of National Stage Entry: **April 5, 2001**) Examiner: **Not Assigned**  
For: **Low Acidity Fermented Dairy**)  
    **Products Flavoured With Warm**)  
    **Flavours**)

**PRELIMINARY AMENDMENT**

Prior to the examination of the above-identified application, please amend the application as follows:

**In the Claims:**

Please cancel claims 1 - 11 without prejudice or disclaimer.

Please add claims 12 - 27 as follows:

12. A flavoured fermented dairy product comprising a warm flavour wherein the product has not been frozen, the Dornic acidity is between 20 and 80 degrees Dornic and the pH is between 4 and 5.5.

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13. The fermented dairy product of claim 12 wherein the Dornic acidity is between 30 and 70 degrees Dornic and the pH is between 4.5 and 4.9.
14. The fermented dairy product of claim 13 wherein the Dornic acidity is between 40 and 60 degrees Dornic.
15. The fermented dairy product of claim 12 wherein the warm flavour is selected from the group consisting of chocolate, caramel, vanilla, coffee, praline, nougat, walnut, hazelnut, almond, pistachio nut and cashew nut flavours.
16. The fermented dairy product of claim 12 wherein the protein content is between 1% and 10%.
17. A method of producing the fermented dairy product of claim 12 comprising
- (a) preparing the starting material including reducing the buffering capacity of the milk raw material;
  - (b) fermenting with at least one lactic acid fermenting agent; and
  - (c) admixing a flavour preparation comprising at least one warm flavour.
18. The method of claim 17 wherein the step of reducing the buffering capacity of the milk raw material is accomplished by reducing the mineral salt content of the raw milk and/or reducing the protein content of the raw milk.

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19. The method of claim 17 wherein the admixing of the flavour preparation precedes the fermenting step.
20. The method of claim 18 wherein the reduction in mineral salt content and/or protein content is achieved via diafiltration of the raw milk starting material.
21. The method of claim 18 wherein the reduction in mineral salt content and/or protein content is achieved via dilution of the raw milk starting material.
22. The method of claim 17 wherein the step of preparing the starting material comprises
- (a) solubilizing carbon dioxide under pressure into a milk raw material, which has a protein concentration of between 25 and 150 g/l, in an amount sufficient to reduce the pH of the material to within the range of 5 to 6.5;
  - (b) subjecting the product of step (a) to diafiltration under carbon dioxide pressure and conditions sufficient to reduce the calcium quantity per gram of protein to between 30% and 80% of its starting ratio;
  - (c) increasing the pH of the diafiltration retentate by removal of a sufficient amount of the solubilized carbon dioxide as necessary to obtain a pH that falls within the normal pH range for non-carbonated milk products which have the same protein content as the retentate.
23. The method of claim 22 wherein the amount of solubilized carbon dioxide added to the raw milk material in step (a) is sufficient to reduce the pH to between 5 and 5.8.

24. The method of claim 22 wherein the diafiltration of step (b) is conducted under conditions that reduce the calcium quantity per gram of protein to between 40% and 70% of its starting ratio.
25. The method of claim 17 wherein the lactic acid fermenting agent is selected from the group of bacterium consisting of *Lactobacillus* sp., *Lactococcus* sp., *Bifidobacteriae* sp..
26. The method of claim 17 wherein the flavour preparation is admixed in an amount sufficient to provide between 1% and 50% of the final product.
27. A composition selected from the group consisting of stirred yoghourt, fromage frais, fermented milk based desserts, fermented milk based spreads and frozen dairy products, further comprising the fermented dairy product of claim 17.

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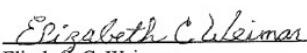
**REMARKS**

Applicants respectfully submit that no prohibited new matter has been introduced by this Preliminary Amendment and that claims 12 to 27 are drawn to the same invention as claims 1-11 of International Application PCT/FR98/02120. The changes to the claims were made to bring the claims into compliance with US rules, such as multiply dependent claims may not depend from multiply dependent claims (see original claims 5-11), the re-phrasing of claim 11 which was drafted as a "use" claim; the re-phrasing of the steps of original method claims 6-11 to use the present tense and the use of established claim terminology such as, "comprising" and "selected from the group consisting of" (see all of the original claims). Also, in consideration of normal usage in US patents, language phrased in the claims of the International Application as optional as been specified (see original claims 6, 7 and 8). The list of "derived" dairy products in original "use" claim 11 is set forth in new claim 27 and is supported by the description in the paragraph bridging pages 6 and 7 of the specification.

If there are any other fees due in connection with the filing of this Preliminary Amendment, please charge the fees to our Deposit Account No. 50-0310. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such an extension is requested and the fee should also be charged to our Deposit Account.

Date: **April 5, 2001**  
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Respectfully submitted,  
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LOW-ACIDITY FERMENTED DAIRY PRODUCTS FLAVOURED WITH  
WARM FLAVOURS

The present invention relates to new fermented dairy products flavoured by the incorporation of warm flavours.

5 The general name "warm" flavours is used to designate flavours such as chocolate, caramel, vanilla, coffee, praline, nougat and/or the flavours of oleaginous fruits (walnut, hazelnut, almond, pistachio nut, cashew nut), and the like.

These aromas, which are generally in great demand from consumers, are widely used in the food industry for the manufacture of desserts. However, their use 10 for flavouring fermented dairy products (for example of the type including yoghourt, milk drinks, fromage frais or derivatives thereof) is limited.

Although fermented dairy products (in particular of the yoghourt type) flavoured with warm flavours are proposed commercially, they are not appreciated by the majority of consumers because of the presence of an aftertaste which alters the true 15 taste of the flavours used.

The inventors have now observed that this organoleptic incompatibility between warm flavours and fermented dairy products was essentially due to the acidity of the latter, which results from the production of lactic acid, causing a reduction of the pH, during fermentation.

20 Fermented dairy products normally have a pH after fermentation of between 4 and 5 approximately, and a Dornic acidity greater than 80°D, generally between 80 and 150°D approximately, depending on their protein content.

The Dornic acidity reflects the buffering capacity of the dairy product during its fermentation; it is expressed in degrees Dornic (°D): one degree Dornic 25 corresponds to the quantity (in ml) of N/9 sodium hydroxide necessary to bring the pH of the product to pH = 8.3, or alternatively the quantity of lactic acid (in mg) in 10 ml of product.

The inventors have discovered that if the Dornic acidity of a 30 fermented dairy product was reduced while its pH was kept at a value less than or equal to 5, a preparation was obtained which could be flavoured with "warm" flavours without denaturing them.

The subject of the present invention is a flavoured fermented dairy product characterized in that its Dornic acidity is 20 to 80 degrees Dornic, preferably 30 to 70°D, and advantageously 40 to 60°D, its pH is 4 to 5.5, preferably 4.5 to 4.9, and in 35 that it is flavoured with a warm flavour.

Preferably, the said warm flavour is chosen from chocolate, caramel, vanilla, coffee, praline, nougat, walnut, hazelnut, almond, pistachio nut and cashew nut flavours and the like.

Although an acidity of up to 80°D can sometimes be acceptable, for example in the case of certain products flavoured with chocolate, it is preferable in most cases, for an optimum preservation of the organoleptic qualities, especially when flavours such as coffee are used, that the acidity does not exceed 70°D, and advantageously 60°D.

Preferably, the flavoured fermented dairy products in accordance with the invention have a protein content (w/w) of 1 to 10%, and advantageously of 2 to 6.5%.

According to a preferred embodiment of a flavoured fermented dairy product in accordance with the present invention, it is a product of the yoghourt type or of the fromage frais type, characterized in that, for a protein content (w/w) of 2% to 10%, and a fat content (w/w) of less than or equal to 15% approximately, preferably of 3 to 12%, its pH is 4 to 5.5, and its Dornic acidity is 20 to 120°D, preferably 40 to 70°D.

According to another preferred embodiment of a flavoured fermented dairy product in accordance with the present invention, it is a product of the fermented drink type, characterized in that, for a protein content (w/w) of 1% to 5%, and a fat content (w/w) of less than or equal to 5% approximately, preferably of the order of 1.5%, its pH is 4 to 5 and its Dornic acidity is 20 to 70°D, preferably 30 to 60°D.

For the production of a fermented dairy product in accordance with the present invention, the fermentation of a dairy raw material is carried out by at least one microorganism capable of performing lactic acid fermentation; it represents in particular microorganisms normally used in lactic ferments, such as *Lactobacillus* sp., *Lactococcus* sp., as well as *Bifidobacteriae* sp., and in particular in yoghourt ferments; preferably, at least one lactic acid bacterium chosen from the group consisting of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* will be used.

The dairy raw materials which can be used for carrying out the present invention are obtained by reducing the buffering capacity of milk, by demineralization and/or by reducing the content of proteins, in particular of calcium phosphocaseinate. The milk used may be derived from any mammalian species, or may be a mixture of milk from various species; it may be, as a whole or in part, milk reconstituted from powdered milk; it may optionally be partially or fully skimmed, supplemented or otherwise with vitamins, sugars or mineral salts.

The reduction in the protein and mineral salt concentration may be obtained by diluting the milk; the demineralization may be obtained by removing the mineral salts either solely from the soluble phase of the milk, or from the soluble phase and from the micellar phase.

5 To reduce the mineral salt concentration of the soluble phase of the milk, it is possible to carry out a diafiltration, especially on an ultrafiltration membrane, and/or a dilution. The dilution makes it possible, in addition, to also reduce the protein concentration.

The diafiltration of the milk can be carried out directly against water.  
10 It is also possible to concentrate the proteins beforehand by ultrafiltration on a membrane. Advantageously, the VCF (volume concentration factor) is 1.2 to 5; a retentate is thereby obtained which has a protein content of 3.8 to 18%.

This retentate is then subjected to diafiltration and/or to dilution.

The diafiltration rate (corresponding to the number of volumes of  
15 water added and to the number of volumes of permeate removed through the ultrafiltration membrane, relative to the volume of milk or of ultrafiltration retentate) is advantageously 0.5 to 5.

The dilution rate is advantageously less than or equal to 9, depending on the mineral salt and protein concentration desired for the product which will be  
20 subjected to fermentation.

To demineralize both the soluble phase and the micellar phase of the milk, the inventors have developed a process using partial demineralization of the milk under CO<sub>2</sub> pressure, followed by a rise in the pH of the demineralized milk, by degassing.

25 The subject of the present invention is also this process which comprises at least:

a) the solubilization of CO<sub>2</sub> under pressure (carbonation), in a milk (optionally diluted or concentrated beforehand), whose protein concentration is between about 25 and about 150 g/l, in order to reduce the pH of the said milk to a value of  
30 between 5 and 6.5, preferably between 5 and 5.8;

b) the partial removal, by diafiltration under CO<sub>2</sub> pressure, of the soluble mineral salts (namely the minerals initially present in the soluble phase of the milk, and the mineral salts released from the micellar phase by the acidification), until a calcium quantity per gram of protein equal to 30% to 80%, preferably 40 to 70%, of the initial quantity is obtained;

c) the increase in the pH of the diafiltration retentate, by removal of the CO<sub>2</sub> (decarbonation), until there is a return to a pH close to the pH of a non-

carbonated milk having the same protein concentration as that of the said diafiltration retentate.

According to a preferred embodiment of the process in accordance with the present invention, the milk used is concentrated, until the desired protein 5 concentration is obtained, either prior to the carbonation of step a), or during the diafiltration of step b).

According to another embodiment of the process in accordance with the invention, the decarbonation of step c) is carried out until there is a return to a pH at least equal to 6.2 and preferably greater than or equal to 6.4.

10 According to yet another embodiment of the process in accordance with the invention, steps a) and b) are carried out at a temperature of between 0 and 20°C, and step c) at a temperature of about 20°C to 70°C and preferably between 20 and 40°C.

15 The pH obtained at the end of step a) depends on the quantity of CO<sub>2</sub> solubilized in the aqueous phase, which itself depends on the pressure used and on the temperature of solution.

Figure 1 represents a chart which makes it possible to determine the CO<sub>2</sub> saturation pressure to be applied during carbonation, in the case of a low-fat milk at 4°C, in order to obtain a given pH (values at CO<sub>2</sub> saturation equilibrium).

20 Figure 2 represents a diagram of the various stages of two preferred embodiments of the process in accordance with the present invention.

The degassing causes a return of the carbon dioxide gas from the dissolved state to the gaseous state (decarbonation).

25 The dairy raw material obtained by the process in accordance with the invention can, in addition, be diluted, as indicated above, at a dilution rate advantageously less than or equal to 9.

The process in accordance with the invention makes it possible to obtain the removal of 40 to 70% of the minerals from the milk.

Prior to the fermentation, the dairy raw materials obtained by the 30 process of demineralization of the soluble phase and of the micellar phase in accordance with the invention, or by one of the other processes described above which make it possible to reduce the buffering capacity, may be optionally subjected to a heat treatment, of the pasteurization or sterilization type, at a temperature of between 60°C and 150°C, preferably between 72 and 140°C, for a period of between 1 second and 20 minutes.

These dairy raw materials can also be supplemented with various additives which make it possible to facilitate the fermentation (by compensating for the

loss of nutrients resulting from the diafiltration, such as for example lactose, amino acids and peptides, vitamins, enzymes and the like), or (in particular in the case of products whose protein concentration has been reduced by dilution) to obtain a thicker texture.

5 If it is desired to obtain a thicker texture, in particular in the case of products whose protein concentration has been reduced by dilution, it may be necessary to compensate for the loss of proteins, in particular of micellar casein, with texturing agents, and/or dietary caseinate and/or vegetable proteins.

10 Texturing agents which can be used are in particular thickeners, gelling agents, emulsifiers, dietary stabilizers such as for example starches and derivatives thereof, gelatin, gums and the like.

Dietary caseinates which can be used are in particular calcium, sodium, potassium and ammonium caseinates.

15 Vegetable proteins which can be used are for example soya milk, soya concentrates and isolates.

The warm flavour preparation may also, if desired, be added before fermentation.

20 The fermentation by lactic ferments is carried out according to conventional procedures. The usual lactic ferments, namely *Lactobacillus* sp., *Lactococcus* sp., as well as *Bifidobacteriae* sp., and in particular the ferments used for the manufacture of yoghurts can be used within the framework of the process in accordance with the invention; preferably, at least one lactic acid bacterium chosen from the group consisting of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* will be used.

25 The invention also covers fermented dairy products which can be obtained by fermenting a dairy raw material resulting from the process of demineralization of the liquid phase and of the micellar phase in accordance with the invention, optionally supplemented as indicated above.

30 The fermented dairy products in accordance with the invention, as well as the fermented dairy products obtained from dairy raw material resulting from one of the other processes described above which make it possible to reduce the buffering capacity, constitute a "white material" to which there will be added, in order to obtain a fermented dairy product in accordance with the invention, a warm flavour preparation, if it has not been previously added to the fermentation.

35 Fermented dairy products which can be used as "white material" for the production of the flavoured products in accordance with the invention are for example:

- thick products of the yoghourt or fromage frais type, characterized in that, for a protein content (w/w) of between 7% and 15%, and a fat content (w/w) of less than or equal to 15% approximately, preferably between 3 and 12%, their pH is between 4 and 5.5, and their Dornic acidity between 60 and 120°D, preferably 70 to 110°D;

5 - products of the yoghourt type, characterized in that, for a protein content (w/w) of between 4% and 7%, and a fat content (w/w) of less than or equal to 10% approximately, preferably between 0 and 5%, their pH is between 4 and 5.5, and their Dornic acidity between 30 and 90°D, preferably 50 to 70°D;

10 - products of the fermented drink type, characterized in that, for a protein content (w/w) of between 2% and 5%, and a fat content (w/w) of less than or equal to 5% approximately, preferably of the order of 1.5%, their pH is between 4 and 5 and their Dornic acidity between 30 and 70°D, preferably between 40 and 60°D.

These fermented dairy products can in particular be obtained by fermenting a dairy raw material resulting from the process of demineralization of the 15 liquid phase and the micellar phase in accordance with the invention.

If necessary, in order to obtain the pH and the Dornic acidity which characterize the flavoured products in accordance with the invention, the fermented products used as white material are diluted, for example, with the warm flavour preparation. Advantageously, the said warm flavour preparation represents between 1 20 and 50%, preferably between 20 and 50% by volume of the final product.

The addition of the warm flavour preparation before or after fermentation is carried out depending on the product which it is desired to obtain. For example, if it is desired to obtain a fermented product of the set yoghourt type, a flavour preparation will be added prior to the fermentation, which can be carried out in pots; if 25 on the contrary it is a fermented product of the stirred type which is desired, a preparation of the chosen flavour will be preferably added to the fermented product.

It is thus possible to obtain fermented products flavoured with chocolate, caramel, praline and the like, or with a mixture of these flavours, by adding preparations of the corresponding flavours.

30 The flavour preparation may optionally contain, in addition to the flavour or the flavours chosen, various additives such as fats (for example cream and/or vegetable fat) emulsifiers, thickeners and the like.

Syrups, powders or flavoured extracts can also be used.

The flavoured fermented dairy products in accordance with the 35 invention may be in particular stirred yoghurts, set yoghurts, drinking yoghurts, fromage frais, fermented milks, yoghurt- or fermented milk-based desserts and the like. These products can also be used as raw materials for the production of derived

dairy products such as, for example, frozen dairy products (yoghurt ice creams), products of the spread type and the like.

The flavoured fermented dairy products in accordance with the invention have a low Domic acidity, while preserving a pH < 5, which makes it possible  
5 to ensure adequate food safety by preventing the development of a contaminating flora during the life of the product.

The fermented products in accordance with the invention may therefore contain live ferment, and may be preserved for the usual period for fresh products (28 days), without losing their organoleptic qualities; if desired, they can also  
10 undergo a heat treatment of the pasteurization or sterilization type (under the conditions defined above), in order to prolong their preservation.

The present invention will be understood more clearly with the aid of the additional description which follows, which refers to nonlimiting examples of preparation of flavoured fermented dairy products in accordance with the present  
15 invention.

It should be clearly understood, however, that these examples are given solely by way of illustration of the subject of the invention and do not constitute in any manner a limitation thereto.

**EXAMPLE 1: PRODUCTION OF A CHOCOLATE-FLAVOURED STIRRED  
20 YOGHOURT**

A fully skimmed cow's milk was subjected to ultrafiltration on an inorganic membrane (TECH SEP, cut-off 15 kDa) until a protein content of 6.4% is obtained in the retentate (1st stage). This retentate is then carbonated at a temperature of about 4°C with a quantity of CO<sub>2</sub> corresponding to a saturation pressure of 2 bar, up to a  
25 pH of about 5.5. Continuous diafiltration is then carried out under the following conditions: 2 volumes of water are added per volume of milk concentrated in the 1st stage, and the same volume is removed through the permeate as the volume of water added. This operation takes place continuously, and makes it possible to preserve the initial protein content of the retentate (6.4%).

30 Calcium and the other mineral salts are partially removed with the permeate, as well as a portion of the lactose and of the other soluble milk constituents. For example, for a skimmed milk containing initially 1230 ppm of calcium per 32.2 g/kg of protein, and 50 g/kg of lactose, a retentate containing 63 g/kg of protein and 1410 ppm of calcium, and 17 g/kg of lactose, is obtained under the carbonation and diafiltration conditions defined above, that is to say a reduction in the calcium content  
35 per gram of protein.

The lactose content of the retentate depends on the ratio between the mass of water added for the diafiltration and the mass of the retentate, as shown in Table I below:

TABLE I

Mass added/mass of the retentate	Lf (%)	Dilution factor (Lf/Li)
0	5.0	1
0.25	4.0	0.8
0.50	3.3	0.66
0.67	3.0	0.60
1.0	2.5	0.50
1.5	2.0	0.40
2.0	1.7	0.34
4.0	1.0	0.20

5

Lf = final lactose in the retentate

Li = initial lactose in the milk (theoretically 50 g/kg, that is to say 5%)

The retentate is then brought to atmospheric pressure, which causes removal of the CO<sub>2</sub>, and then the degassing is continued under vacuum, until a rise in pH to 6.4 is obtained (at 25°C).

10

The following ingredients are then added to the retentate (expressed in % by weight of the final mixture):

- waxy maize starch (hydroxypropylated) 0.7
- gelatin\* 0.3
- water 5.0
- sucrose 3.0
- cream containing 40% fat 12.0

\* Gel strength: 250 blooms = (250 grams)

15

The mixture is then subjected to a heat treatment at 95°C for 4 minutes, and is then homogenized in an APV/RANNIE homogenizer, 120 l/hour (30 bar) and cooled to 43°C before being inoculated with an *L. bulgaricus* and *S. thermophilus* culture.

The fermentation is carried out in an oven regulated at 43°C, until a pH of 4.6 to 4.7 is obtained. The fermentation is stopped by cooling the preparation to 20°C.

20

A mixture is prepared whose composition (in % w/w) is the following:

- cream containing 40% fat	24.0
- waxy maize starch (native)	3.5
- grated dark chocolate for crunching	4.5
- cocoa powder containing 21% fat	4.5
- sucrose	27.5
- water qs	100

The mixture is sterilized at 130°C for 30 seconds, and after cooling is mixed with an equal weight of the fermented preparation.

The mixture is distributed into pots which are stored in a refrigerated and ventilated chamber (4°C). The pH of the final product is about 5.2 for a Dornic acidity of about 45°D.

#### **EXAMPLE 2: PRODUCTION OF A CHOCOLATE-FLAVOURED SET YOGHOURT**

A fully skimmed cow's milk is ultrafiltered, and then carbonated, diafiltrated and degassed, as indicated in Example 1.

The following ingredients (expressed in % by weight of the final mixture) are then added to the diafiltration retentate:

- grated dark chocolate for crunching	4.0
- cocoa powder containing 21% fat	0.4
- cream containing 40% fat	8.5
- sucrose	16.0
- water	10.0

The mixture is then subjected to a heat treatment at 95°C for 4 minutes, and is then homogenized in an APV/RANNIE homogenizer, 120 l/hour (200 bar), and cooled to 43°C before being inoculated with an *L. bulgaricus* and *S. thermophilus* culture.

The fermentation is carried out in pots in an oven regulated at 43°C, until a pH of 4.6 to 4.8 is obtained. The fermentation is stopped by cooling the pots to 4°C.

The pots are stored in a refrigerated and ventilated chamber (4°C).

The pH of the final product is about 4.75 for a Dornic acidity of about 65°D.

#### **EXAMPLE 3: STIRRED CHOCOLATE YOGHOURT**

##### **Process of preparation**

1. Preparation of the white mass:

- 5-fold concentration of skimmed milk by tangential ultrafiltration on

an inorganic membrane;

- 4.9-fold dilution of the retentate with water (soft or demineralized) to 3.35% protein;
  - addition of cream containing 40% fat in an amount of 14% of the volume of dilute retentate, and of 8% sugar;
- 5                    - pasteurization 4' at 95°C and homogenization;
- fermentation, in an oven, of this mixture cooled to 43°C with an *L. bulgaricus* and *S. thermophilus* culture until a pH of 4.6 to 4.7 is obtained;
- cooling to 20°C.
- 10                2. Preparation of a chocolate-flavoured mixture, according to the composition indicated below, and sterilization;
- Composition of the chocolate preparation (% w/w):
- |                          |      |
|--------------------------|------|
| cream containing 40% fat | 26.5 |
| chocolate 60/40          | 60   |
| invert sugar             | 13   |
| salt                     | 0.4  |
| vanillin                 | 0.1  |
- 15                3. Mixing of the white mass (at 20°C approximately) with the chocolate-flavoured preparation (at 35°C approximately) in the respective proportions of 80 and 20% (% w/w);
- packaging in pots and refrigeration at 4°C.

**Characteristics of the product:**

Final pH = about 4.9;

Acidity = 55 degrees Dornic approximately;

Viscosity = 1000 to 2000 mPa.s according to the intensity of the shearing stress applied.

20                **EXAMPLE 4: DEMINERALIZED MILK-BASED SET CHOCOLATE YOGHOURT**

**Process of preparation:**

- diafiltration by a factor of 2 (2 volumes of water are added to 1 volume of milk and 2 volumes of permeate are recovered) of skimmed milk (tangential ultrafiltration on an inorganic membrane);
- the following ingredients are added (the quantities are given in % in the finished product), to the diafiltered milk:

grated dark chocolate for crunching	4%
cocoa powder (containing 21% fat)	0.40%
cream containing 40% fat	8.50%
sucrose	16%
waxy maize native starch	0.30%
	- pasteurization 4' at 95°C and homogenization;
	- fermentation of this chocolate-flavoured mixture cooled to 43°C (in pots) in an oven with an <i>L. bulgaricus</i> and <i>S. thermophilus</i> culture until a pH of 4.6 approximately is obtained;
5	- cooling of the yoghurts to 4°C.

**Characteristics of the product:**

Final pH = about 4.75;  
 Acidity = 40 degrees Dornic approximately;  
 Gel strength = about 400 N.m;

**10 EXAMPLE 5: STIRRED YOGHOURT-TYPE, CHOCOLATE-FLAVOURED FERMENTED MILK****Process of preparation:**

1. White mass: preparation of the following mixture (% w/w):

skimmed milk	84%
skimmed milk powder	0.90%
cream containing 40% fat	6.75%
sodium caseinate	1.15%
sugar	7%

- 15 - pasteurization 4' at 95°C and homogenization;  
 - fermentation, in an oven, of this mixture cooled to 38°C with a culture of *L. bulgaricus* and *S. thermophilus* until a pH of 4.6 to 4.7 is obtained;  
 - cooling to 20°C.

2. Preparation of a chocolate-flavoured mixture according to the composition indicated below, and sterilization:

**20 Composition of the chocolate preparation (% w/w)**

cream containing 40% fat	26.5
chocolate 60/40	60
invert sugar	13
salt	0.4
vanillin	0.1

3. Mixing of the white mass (at 20°C approximately) with the chocolate-flavoured preparation (at 35°C approximately) in the respective proportions of 75 and 25% (% w/w);  
 - packaging in pots and refrigeration at 4°C.

5 **Characteristics of the product:**

- Final pH = about 4.8;  
 Acidity = 53 degrees Dornic approximately;  
 Viscosity = 1000 to 2000 mPa.s according to the intensity of the shearing stress applied.

**EXAMPLE 6: CHOCOLATE-FLAVOURED DRINKING FERMENTED MILK**

10 **Process of preparation:**

- diafiltration of skimmed milk by a factor of 2 (2 volumes of water for one volume of milk);  
 - mixing: 93.7% of this diafiltered milk, 5% cream containing 40% fat and 1.3% sugar syrup at 67%;

15 - pasteurization 4' at 95°C and homogenization;  
 - cooling to 38°C and fermentation by the yoghurt ferments;  
 - cooling to 20°C and mixing with the chocolate-flavoured preparation of Example 3 in the proportions 90/10.

**Characteristics of the product:**

20 40°Dornic approximately at pH 4.65;  
 Viscosity = about 55 mPa.s.

**EXAMPLE 7: CHOCOLATE-FLAVOURED FROMAGE FRAIS**

**Process of preparation:**

- 2.15-fold concentration of milk by tangential ultrafiltration on an inorganic membrane to 7.1% protein;  
 - diafiltration of the retentate 3 times with water (3 volumes of water are added to one volume of retentate and 3 volumes of permeate are recovered);  
 - storage overnight at 4°C of the diafiltered retentate;  
 - addition of fat (cream), and of sugar, in order to obtain the following

30 mixture:

diafiltered retentate containing

7.1% protein	81.8%
skimmed milk powder	1.4%
cream containing 40% fat	9.8%
sugar	7%

- pasteurization 4° at 95°C and homogenization;
  - fermentation, in an oven, of this mixture cooled to 40°C, with an *S. thermophilus* culture until a pH of 4.6 is obtained;
    - cooling to 20°C/smoothing of the stirred yoghurt type with various
  - 5 possible shearing stresses depending on the desired viscosity;
    - preparation and sterilization of a chocolate-flavoured mixture (see Example 3);
      - mixing of the white mass (at 20°C approximately) with the chocolate-flavoured preparation (at 35°C approximately) in the respective proportions of 75 and 25% (% w/w);
        - packaging in pots and refrigeration at 4°C.

#### **Characteristics of the product:**

Final pH = about 4.7;

Acidity = 70 degrees Dornic approximately;

- 15 Viscosity = about 1000 to 2500 mPa.s according to the intensity of the shearing stress applied.

## CLAIMS

- 1) Flavoured fermented dairy product having not been frozen, characterized in that its Dornic acidity is 20 to 80 degrees Dornic, its pH is 4 to 5.5, and in that it is flavoured with a warm flavour.
- 5        2) Flavoured fermented dairy product according to Claim 1, characterized in that its Dornic acidity is 30 to 70°D, and its pH is 4.5 to 4.9.
- 3) Flavoured fermented dairy product according to Claim 2, characterized in that its Dornic acidity is 40 to 60°D.
- 4) Flavoured fermented dairy product according to any one of Claims
- 10      1 to 3, characterized in that the said warm flavour is chosen from chocolate, caramel, vanilla, coffee, praline, nougat, walnut, hazelnut, almond, pistachio nut and cashew nut flavours.
- 5) Flavoured fermented dairy product according to any one of Claims 1 to 4, characterized in that its protein content is 1 to 10%.
- 15      6) Process for the production of a flavoured fermented dairy product according to any one of Claims 1 to 5, characterized in that it comprises:
- the preparation of a dairy raw material, by reducing the buffering capacity of the milk by reducing its mineral salt content, and/or its protein content;
  - the fermentation of the said raw material by at least one lactic ferment;
  - the addition, to the dairy raw material before fermentation, or to the fermented product obtained, of a flavour preparation comprising at least one warm flavour.
- 7) Process according to Claim 6, characterized in that the preparation
- 25      of the dairy raw material comprises reducing the mineral salt and/or protein content of the soluble phase of the milk by diafiltration and/or by dilution of the said milk.
- 8) Process according to Claim 6, characterized in that the preparation of the dairy raw material comprises at least:
- 30      a) the solubilization of CO<sub>2</sub> under pressure, in a milk whose protein concentration is between 25 and 150 g/l, in order to reduce the pH of the said milk to a value of between 5 and 6.5, preferably between 5 and 5.8;
- b) the partial removal, by diafiltration under CO<sub>2</sub> pressure, of the soluble mineral salts, until a calcium quantity per gram of protein equal to 30% to 80%, preferably 40 to 70%, of the initial quantity is obtained;

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c) the increase in the pH of the diafiltration retentate, by removal of the CO<sub>2</sub>, until there is a return to a pH close to the pH of a noncarbonated milk having the same protein concentration as that of the said diafiltration retentate.

9) Process according to any one of Claims 6 to 8, characterized in that  
5 the fermentation is carried out by at least one bacterium chosen from the group consisting of *Lactobacillus* sp., *Lactococcus* sp., and *Bifidobacteriae* sp.,

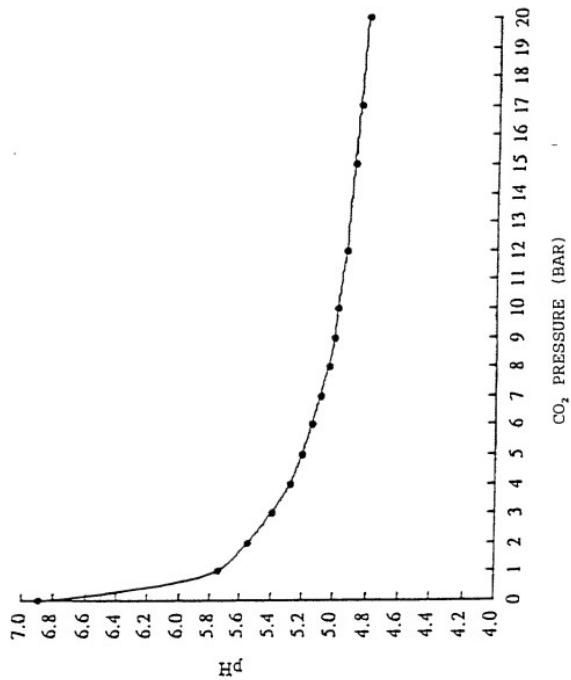
10) Process according to any one of Claims 6 to 9, characterized in that the flavour preparation represents between 1 and 50% by volume of the flavoured final product.

11) Use of a flavoured fermented dairy product according to any one of Claims 1 to 5 as raw material for the production of derived dairy products, in particular of frozen dairy products.

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FIGURE 1



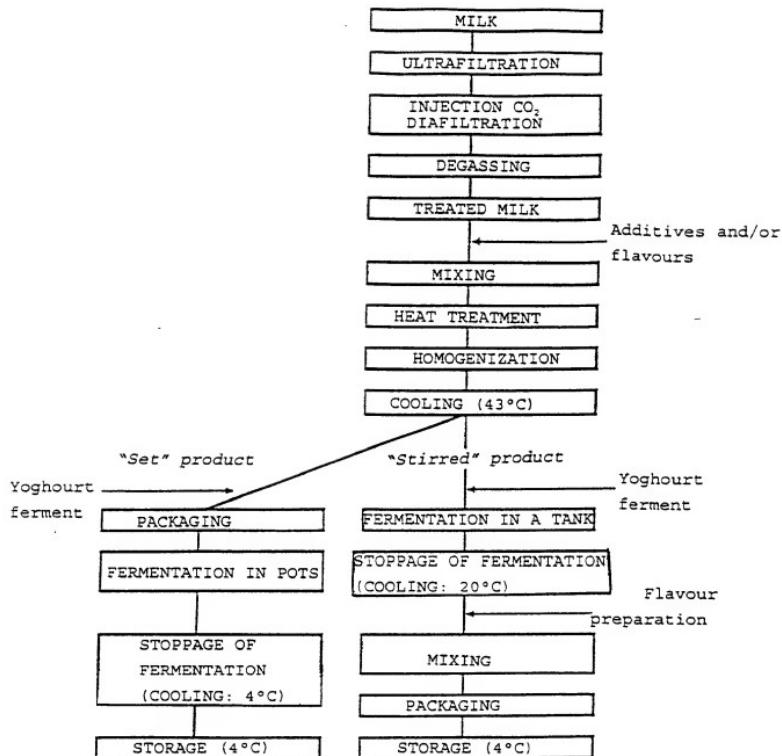


FIGURE 2

**COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY**U.S. DEPARTMENT OF COMMERCE  
Patent and Trademark Office

ATTORNEY DOCKET NO.: 045636-5042

As a below named inventor, I hereby declare that :

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled :

**LOW ACIDITY FERMENTED DAIRY PRODUCTS FLAVOURED WITH WARM FLAVOURS**

the specification of which :

is attached hereto ; or

 was filed as United States application Serial No. 09/806,821 on April 5, 2001 and was amended on \_\_\_\_\_ (if applicable) ; or was filed as a PCT international application Number PCT/FR98/02120 on October 5, 1998 and was amended under PCT article 19 on \_\_\_\_\_ (if applicable). I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose the U.S. Patent and Trademark Office information which is material to the patentability of claims presented in this application in accordance with Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate or §365(a) of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed :

**PRIOR FOREIGN APPLICATION(S) :**

COUNTRY (if PCT, indicate PCT)	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED

Combined Declaration For Patent Application and Power of Attorney – (Continued)  
(includes Reference to PCT International Applications)

ATTORNEY DOCKET NO. 045636-5042

I hereby claim the benefits under Title 35, United States Code §119(e) of any United States provisional application(s) listed below.

U.S. PROVISIONAL APPLICATIONS

U.S. PROVISIONAL APPLICATION NO.	U.S. FILING DATE

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or §365 ( c ) of any PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose to the U.S Patent and Trademark Office all information known to me to be material to the patentability of claims represented in this application in accordance with Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application :

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT :

U.S. APPLICATIONS		STATUS (Check one)		
U.S. APPLICATION NO.	U.S. FILING DATE	PATENTED	PENDING	ABANDONED

**POWER OF ATTORNEY:** As a named inventor, I hereby appoint the registered practitioners of Morgan, Lewis & Bockius LLP included in the Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and direct all correspondence be addressed to that Customer Number.

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Combined Declaration For Patent Application and Power of Attorney – (Continued)  
(includes Reference to PCT International Applications)

ATTORNEY DOCKET NO. 045636-5042

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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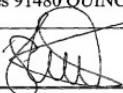
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